

### Reply To Examiner's Remarks

Claims 3-4, 6, 9-12 and 48, as amended, are presented for consideration.  
Claims 1-2, 5, 7-8 and 13-47 are canceled.

The Examiner objects to claims 6 and 48, observing that: (1) in claim 6, the dependency should refer to claim 48, not to claim 49; and (2) claim 48 should recite the "first composition, not the "fist composition." Claims 6 and 48 are amended to make these corrections.

The Examiner rejects claims 3-4, 6, 9-12 and 48 under 35 U.S.C. 112, first and second paragraphs, asserting that some subject matter recited in these claims has no support in the specification.

A brief review of information disclosed in paragraphs of the specification is appropriate here.

Paragraph [0011]: embodiment no. 1 comprises substrate plus coating; substrate includes  $\text{TaSi}_2 + \text{B}_2\text{O}_3.\text{SiO}_2$  ("BSi"); coating includes processing aid  $\text{SiB}_6$  ("SHB").

Paragraph [0012]: embodiment no. 2 comprises porous substrate plus sub-layer including sub-sub-layers 1 and 2; sub-layer includes  $\text{MoSi}_2 + \text{SHB}$ , forming a functional gradient that impregnates the substrate; sub-sub-layer 2 includes  $\text{TaSi}_2 + \text{MoSi}_2 + \text{SiB}_6 + \text{BSi}$ .

Paragraph [0013]: embodiment no. 3 comprises porous substrate plus coating that impregnates substrate; coating includes  $\text{TaSi}_2 + \text{MoSi}_2 + \text{BSi}$ .

Paragraph [0025]: ceramics are formed from  $\text{TaSi}_2 + \text{SiB}_6 + \text{BSi}$ .

Paragraph [0026]: embodiment comprises substrate plus sub-layer; substrate includes  $\text{TaSi}_2$  (5-70 %) +  $\text{MoSi}_2$  (0-30 %) +  $\text{BSi}$  (10-95 %); more preferably, substrate includes  $\text{TaSi}_2$  (10-65 %) +  $\text{MoSi}_2$  (5-30 %) +  $\text{BSi}$  (20-45 %); sub-layer includes  $\text{MoSi}_2$  (20-60 %) +  $\text{BSi}$  (40-80 %) +  $\text{SiB}_6$  (1-5 %); sub-layer impregnates

substrate to form a functional gradient; sub-layer may be used to increase coefficient of thermal expansion (CTE) and/or density to more closely match CTE and/or density of substrate.

Paragraph [0027]: Mentions that CTE of sub-layer can be made to approximately match CTE of substrate.

Paragraph [0028]: coating includes  $\text{TaSi}_2$  (35 %) +  $\text{MoSi}_2$  (20 %).

Paragraph [0029]: substrate includes  $\text{TaSi}_2$  (65 %) +  $\text{MoSi}_2$  (15 %).

Paragraph [0030]: substrate includes  $\text{MoSi}_2$  (35 %) +  $\text{MoSi}_2$  (20 %).

Paragraph [0032]: coating includes  $\text{TaSi}_2$  +  $\text{MoSi}_2$  +  $\text{BSi}$  .

Paragraph [0037] (example 1): embodiment comprises substrate plus sub-layer; substrate includes  $\text{TaSi}_2$  (35 %) +  $\text{MoSi}_2$  + (20 %) +  $\text{BSi}$  (52.5 %) +  $\text{SiB}_6$  (2.5 %); sub-layer includes  $\text{MoSi}_2$  (55 %) +  $\text{BSi}$  (42.5 %) +  $\text{BSi}$  (2.5 %).

Paragraph [0038] (example 2): embodiment includes substrate plus sub-layer; substrate includes  $\text{TaSi}_2$  (60 %) +  $\text{MoSi}_2$  (15 %) +  $\text{BSi}$  (22.5 %) +  $\text{SiB}_6$  (2.5 %).

Paragraph [0039] (example 3): substrate includes  $\text{TaSi}_2$  (50 %) +  $\text{BSi}$  (45 %) +  $\text{SiB}_6$  (5 %).

Paragraph [0040] (example 4): substrate includes  $\text{TaSi}_2$  (45 %) +  $\text{MoSi}_2$  (10 %) +  $\text{BSi}$  (42.5 %) +  $\text{SiB}_6$  (2.5 %).

Paragraph [0041] (example 5): embodiment comprises substrate plus sub-layer layer; substrate includes  $\text{TaSi}_2$  (40 %) +  $\text{MoSi}_2$  + (15 %) +  $\text{BSi}$  (42.5 %) +  $\text{SHB}$  (2.5 %); sub-layer includes  $\text{MoSi}_2$  (55 %) +  $\text{BSi}$  (42.5 %) +  $\text{SiB}_6$  (2.5 %).

Paragraph [0042] (example 6): ): embodiment comprises substrate plus sub-layer; substrate includes  $\text{TaSi}_2$  (50 %) +  $\text{MoSi}_2$  + (20 %) +  $\text{BSi}$  (27.5 %) +  $\text{SiB}_6$  (2.5 %); sub-layer includes  $\text{MoSi}_2$  (20 %) +  $\text{BSi}$  (77.5 %) +  $\text{SiB}_6$  (2.5 %).

Paragraph [0043] (example 7): substrate includes TaSi<sub>2</sub> (10 %) + MoSi<sub>2</sub> (30 %) + BSi (57.5 %) + SiB<sub>6</sub> (2/5 %).

Paragraph [0044] (example 8): embodiment comprises substrate plus sub-layer; substrate includes TaSi<sub>2</sub> (50 %) + BSi (27.5 %) + SiB<sub>6</sub> (2.5 %); sub-layer includes MoSi<sub>2</sub> (55 %) + BSi (42.5 %) + SiB<sub>6</sub> (2.5 %).

Paragraph [0045] (example 9): embodiment comprises substrate plus sub-layer; substrate includes TaSi<sub>2</sub> (25 %) + MoSi<sub>2</sub> (50 %) + BSi (22.5 %) + SiB<sub>6</sub> (2.5 %); sub-layer includes MoSi<sub>2</sub> (55 %) + BSi (42.5 %) + SiB<sub>6</sub> (2.5 %).

Collecting this information together, the following ranges of constituents are disclosed for the substrate and for the sub-layer:

Substrate:

TaSi<sub>2</sub>: 5-70 %, 10-65 %, 25 %, 35 %, 45 %, 50 %, 60 %, 65 %

MoSi<sub>2</sub>: 0-30 %, 5-30 %, 10 %, 15 %, 20 %, 25 %, 30 %

BSi: 10-95 %, 20-45 %

SiB<sub>6</sub>: 2.5 %

Sub-layer(s):

MoSi<sub>2</sub>: 20 %, 20-60 %, 55 %

BSi: 40-80 %, 42.5 %, 77.5 %,

SiB<sub>6</sub>: 1-5 %, 2.5 %,

Coating:

TaSi<sub>2</sub>: 35 %

MoSi<sub>2</sub>: 20 %,

The Examiner's assertions are considered here seriatim.

1. The Examiner asserts that no support exists for the statement that a (single?) layer contains 5-70 percent TaSi<sub>2</sub>; that this is supported only where two or more layers are present. Claim 48 recites presence of a first layer and a second layer.

2. The Examiner asserts that the specification supports only a range of TaSi<sub>2</sub> of approximately 5-70 percent, not a range "between" 5 and 70 percent. The Applicants are uncertain what the Examiner objects to, because recitation of a range 5-70 percent includes all percentages between 5 percent and 70 percent, including but not limited to 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65 and 70 percent tantalum disilicide.

3. The Examiner asserts that teaching a range of 0-30 percent for MoS<sub>2</sub> (for the substrate) in claim 48 does not support a percentage value of 1 percent for this constituent. Paragraph [0026] teaches a range of 5-30 percent for MoSi<sub>2</sub>. Claim 48 is amended to recite a range of 5-30 percent for MoSi<sub>2</sub>.

4. The Examiner asserts that there is no support for the recitation, in claim 48 of first through sixth non-zero percentages of the compositions forming the first and second layers. Claim 48 is amended herein to delete any reference to first, second, third, fourth, fifth and/or sixth percentages.

5. The Examiner asserts that no support exists, for the recitation in claim 48, that the first, second and third constituent percentages are chosen to adjust the CTE for the first layer to match the CTE for the substrate; the specification provides support for adjusting layer 510. The specification recites that the sub-layer CTE preferably closely matches the CTE of the substrate. Claim 48 is amended to more clearly recite this near matching.

6. The Examiner asserts that no support exists for a recitation in claim 48 that the fourth, fifth and sixth constituents are adjusted to provide a protective layer when exposed to temperatures up to 3000 degrees. According to the Examiner's rejection, providing a layer that is demonstrably a protective layer when the assembly is exposed to temperatures about 3000 degrees F does not indicate that the protective layer functions as desired at all temperatures in a range 0 – 3000 degrees F. The Applicants observe that a thermal protection material, at an initial temperature  $t = T_0$  that fails at a first selected temperature  $T = T_1 (T_0 < T_1 < 3000\text{ }^{\circ}\text{F})$  will also fail when heated to a second selected temperature,  $T = T_2 \approx 3000\text{ }^{\circ}\text{F} (> T_0)$ , because the temperature of the thermal protection material must first be raised from  $T_0$  to  $T_1$ , before being heated further to  $T_2$ . Claim 498 is amended herein to recite that the combined first and second layers form a protective layer for operation at temperatures of approximately  $T = 3000\text{ }^{\circ}\text{F}$ .

7. The Examiner asserts that use of the word “between” for composition ranges in claim 6 is improper because the specification only provides support for reciting “approximately” this range of amounts. Claim 6 is amended herein to recite that each of the three named constituents lies between a first value and a second value for that constituent ( $\text{TaSi}_2$ ,  $\text{MoSi}_2$  and  $\text{B}_2\text{O}_3.\text{SiO}_2$ ).

8. The Examiner asserts that claim 48 recites specific amounts of three constituents ( $\text{TaSi}_2$ ,  $\text{MoSi}_2$  and  $\text{B}_2\text{O}_3.\text{SiO}_2$ ) and also recites three non-zero percentages for certain constituents, making it unclear what range(s) the Applicants are attempting to claim. Claim 48 is amended herein to delete any reference to first, second, third, fourth, fifth and/or sixth percentages.

The Applicants have amended claims 3, 6 and 9-12 and 48 to attempt to remove inconsistencies noted by the Examiner and to clarify what is the invention

as claimed. The Applicants thank the Examiner for the detailed analysis of the language problems and consistency problems in the claims.

The Applicants believe that, with the amendments made to claims 3, 6 and 9-12 and 48, the application, including claims 3-4, 6, 9-12 and 48, as amended, is in proper form for allowance. The Applicants request that the Examiner pass the application, including claims 3-4, 6, 9-12 and 48, as amended, to issue as a U.S. patent.

Respectfully Submitted,

/john schipper\_\_\_\_\_

Date: 16 November 2008

John Schipper

Patent representative for Applicants